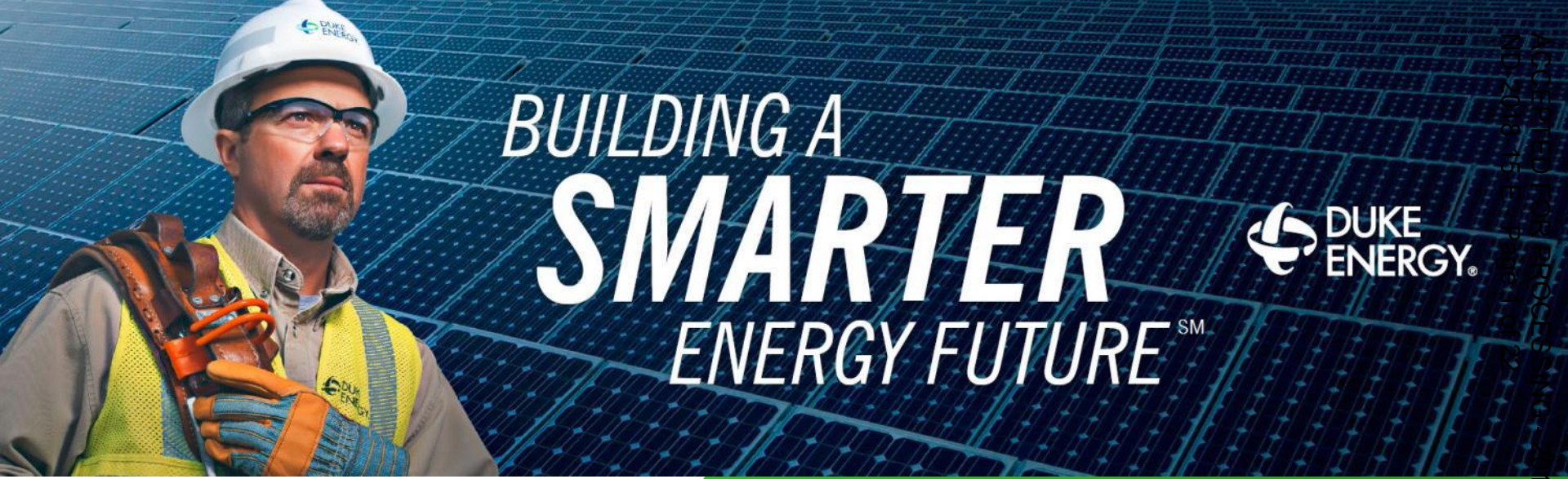


POWER/FORWARD CAROLINAS

Bobby Simpson | Director, Grid Improvement Plan Integration | Duke Energy

Allowable Ex Parte Briefing before the Public Service Commission of South Carolina

May 23, 2018; NDI 2018-15-E

“What Got You Here Won’t Get You There”

Marshall Goldsmith

The Need is Clear

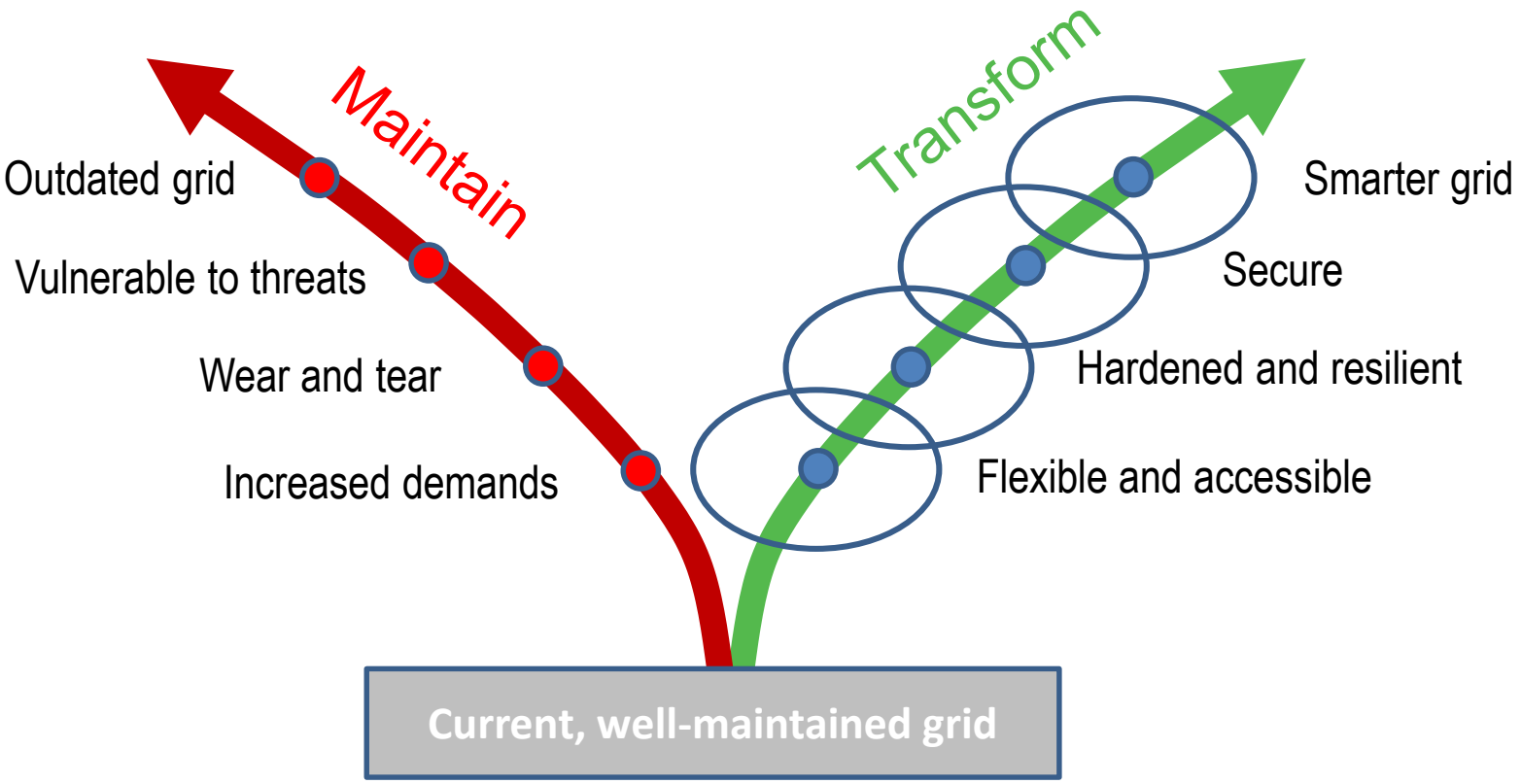
Customer expectations have changed.

People rely on electricity more than ever to power their lives and businesses. Power is no longer a convenience, nor is it a luxury.

Severe weather events are increasing, and **cyber and physical attacks** on the grid are real.

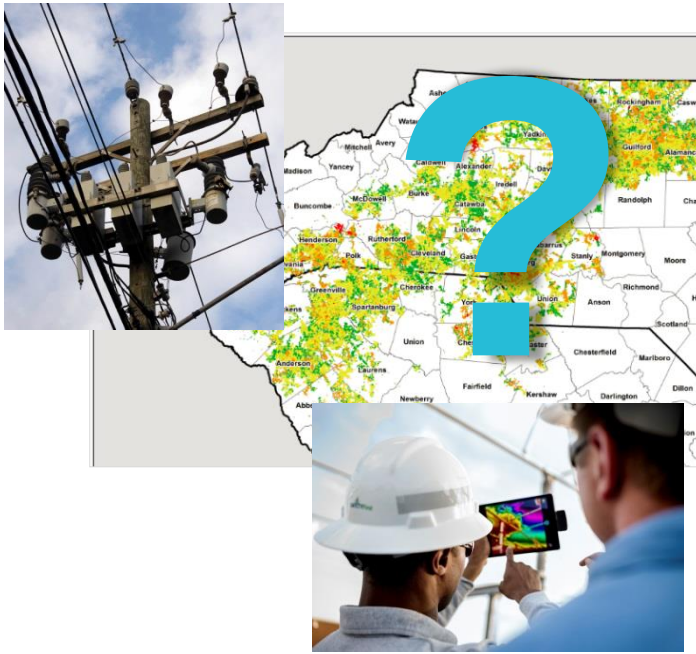
Technology is available to enable a transition from a mechanical grid that is aging, to a more modern digitalized grid.

Maintenance vs. Transformation



Why not before?

- The data science didn't exist to see the grid the way we can today
- Automated technologies were still maturing
- Grid components were not networked
- The grid didn't have a brain
- Predictive analytics and decision making was still evolving



DUKE ENERGY®

Power/Forward CAROLINAS

Building a smarter grid for CUSTOMERS

IMPROVE RELIABILITY
to avoid outages and speed restoration

HARDEN THE GRID
against physical and cyber impacts

GIVE MORE OPTIONS AND CONTROL
over energy use and tools to save money

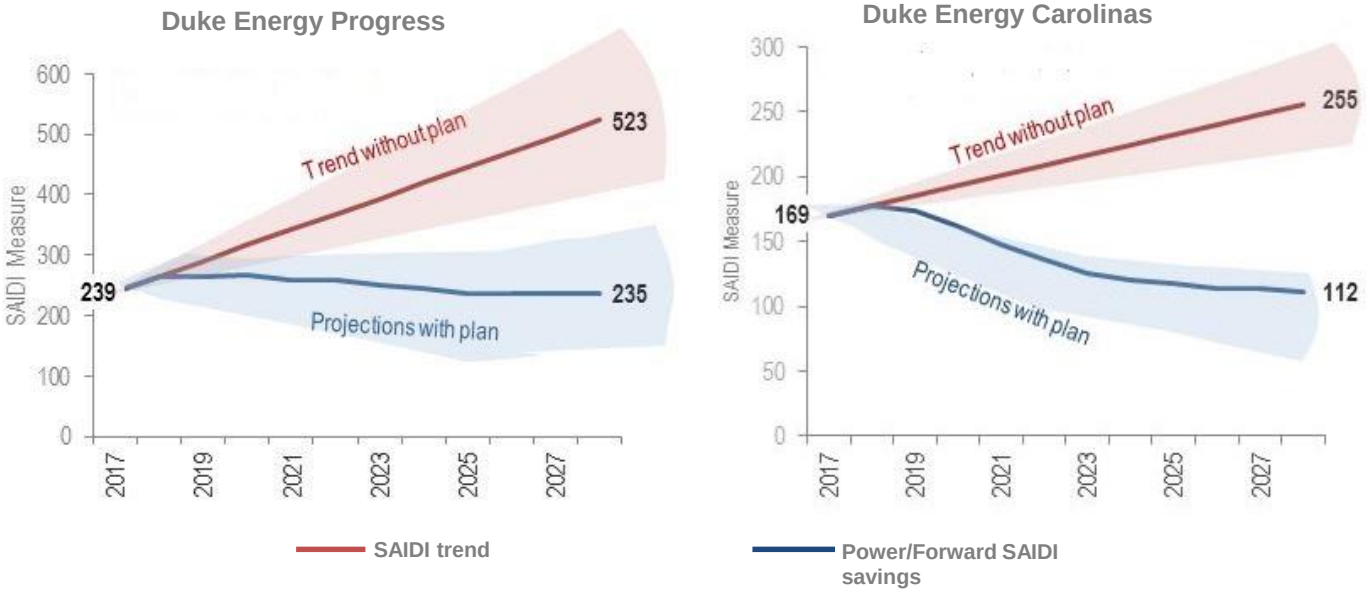
EXPAND SOLAR AND RENEWABLES
across a two-way, smart-thinking grid

Core Reliability Improvements

Power/Forward can improve core reliability by 40-60%

by reducing the number and duration of everyday outages, as well as reducing customer momentaries

Sustained Outages



SAIDI – System Average Interruption Duration Index

Reduced Major Storm Impacts

REDUCTION IN MAJOR STORM IMPACTS	Customers Interruptions (CI)	Customer Mins Interrupted (CMI)
10-year historical average, SC	232,271	210M
Estimated reduction (%)	30%	30%
Forecasted MED impacts after Power/Forward	**154,187**	**147 million**

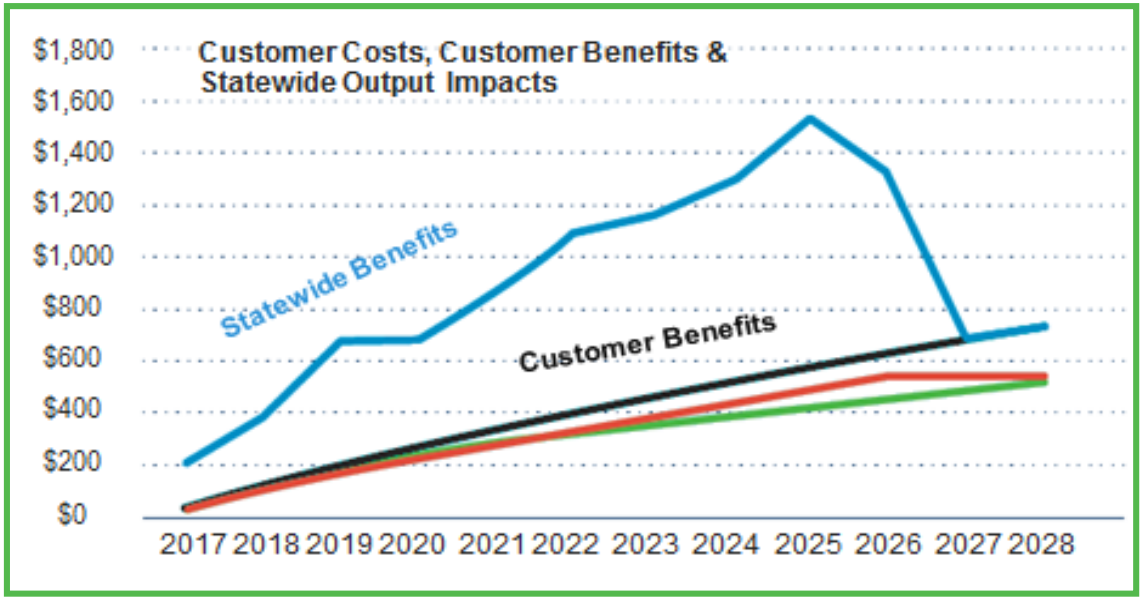
Power/Forward reduces major storm impacts by around 30% by undergrounding the most vulnerable overhead tap lines on the grid.

Major storm impacts in the Carolinas

Homes and businesses that are impacted annually by major event days (MEDs) experience, on average,

12 hours of interruption

Statewide Economic Impact (SC)



Source:Von Nessen Study

- **Customer cost:** increased electricity rates
- **Customer benefits**: Reduction in outage-related costs
- **Customer benefits**: Reduction in outage-related costs plus potential increase in business sales
- **Statewide benefits:** Total change in gross output

	Economic Output from Capital Investment	Annual Cost (rate ▲)	Reduced outage-related costs	Annual Net Benefit (after rate ▲)
SC	$5.8B at end of P/F	$84M (2018) to $530M (2028)	$503 million to $724 million (2028)	Up to $194M by year 10

Jobs and Community Growth

People Future

Building the energy future will put thousands to work throughout the Carolinas.

- Approximately 3,300 jobs created for the state of South Carolina the Duke Energy grid investment, with 5,400 at peak.
- $200 million in new salaries and wages, with nearly $315 million at peak
- Economic contribution equivalent to three major automotive manufacturing announcements

DUKE ENERGY®

(2017 – 2028)

$10.5 billion

SC - STATEWIDE ECONOMIC BENEFIT

$5.8 billion economic output

2,400 jobs created

Power/Forward CAROLINAS

$4.7 billion economic output

3,000 jobs created

INVESTMENT

RELIABILITY

10-year plan

$3.1 billion
initial investment

making the grid smarter, more reliable and more secure, while stimulating economic growth

Seven Strategic Programs

Targeted Underground

- Reduced outages and momentary interruptions
- Faster response to major storms
- Improved customer satisfaction

$1.3 B

Hardening & Resiliency

- Reduced asset failures (hardening)
- Rapid outage recovery (resiliency)
- Updated system design & security

$704 M

Self-Optimizing Grid

- Automated fault isolation and power rerouting
- Modern circuit segmentation standards
- Support two-way power flow

$385 M

Smart Meters

- Enhanced billing options
- Detailed usage data
- Improved outage detection

$107 M

Transmission Improvements

- System intelligence / monitoring
- Flood mitigation
- Physical and cyber security

$533 M

Communication Network Upgrades

- Secure high-speed, high-bandwidth comm pathways
- Enablement of more smart grid devices

$74 M

Advanced Enterprise Systems

- Intelligent device management & monitoring
- Self-optimizing technology enablement

$23 M

Targeted Undergroun

Using advanced data to strategically move thousands of miles of the most outage-prone overhead power lines underground

TARGETED UNDERGROUND PROGRAM

- Significantly reduce outages
- Reduces power blips and blinks
- More efficient storm restoration efforts

Targeted Underground Program drives **higher reliability** by significantly reducing risk of outage-causing line faults on susceptible power line segments.

Targeted Undergroun

PROJECT EXAMPLE:
QUIET ACRES – SPARTANBURG, S.C.

- Extended tap line
- Overhead service count: 20
- Number of easements needed: 21
- Overhead miles: 0.2584
- Events / target miles over 10 Years: 96.75
- Total customer minutes interrupted (CMI): 28,735.35

Targeted Undergroun

IMPROVEMENTS ACROSS THE STATE

COUNTY	TUG MILES
Abbeville	4.09
Anderson	291.16
Cherokee	38.58
Chester	37.53
Chesterfield	32.03
Clarendon	26.80
Darlington	95.04
Dillon	32.10
Fairfield	2.35
Florence	152.53
Georgetown	8.04
Greenville	529.71
Greenwood	63.18
Horry	2.29

COUNTY	TUG MILES
Kershaw	9.11
Lancaster	100.25
Laurens	29.26
Lee	21.35
Marion	45.34
Marlboro	17.31
Newberry	5.43
Oconee	22.63
Pickens	72.11
Spartanburg	410.73
Sumter	106.31
Union	1.10
Williamsburg	38.87
York	80.67

Distribution Hardening & Resiliency

HARDENING

Lower system risk from physical and cyber risks and prevent outages from occurring

Grid Integrity and Event Elimination

- Transformer retrofit
- Deteriorated conductor / UG cable Replacement
- Oil filled equipment replacement

RESILIENCY

Minimize event impacts and speed restoration

Event Impact Reduction & Recovery

- Sectionalization
- Rural circuit ties
- High impact sites
- Capacity margin

GSP Airport

Cheraw Pee Dee River Crossings

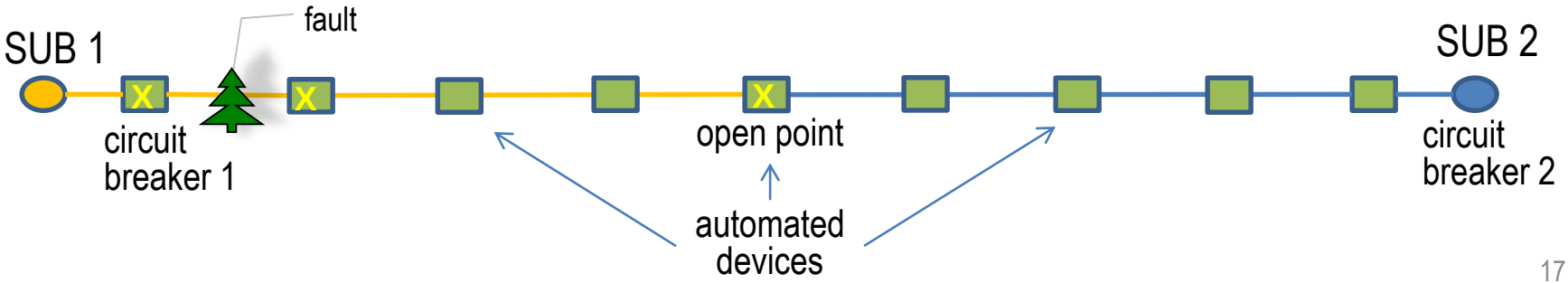
Aynor

Longtown

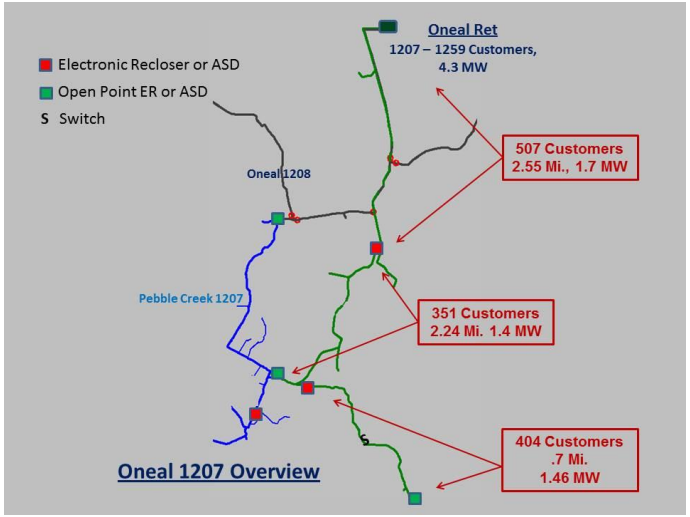
Self-Optimizing Grid

SELF-OPTIMIZING GRID anticipates outages and intelligently reroutes service to keep power on for customers. This smart-thinking grid will also automatically optimize itself and will support the two-way power flow needed to support the growth of technologies like rooftop solar, battery storage and micro-grids.

- ✓ **Connectivity**: multiple pathways for flexibility and outage avoidance
- ✓ **Capacity**: better infrastructure to support new technology and faster restoration
- ✓ **Control**: intelligent automation to optimize the grid



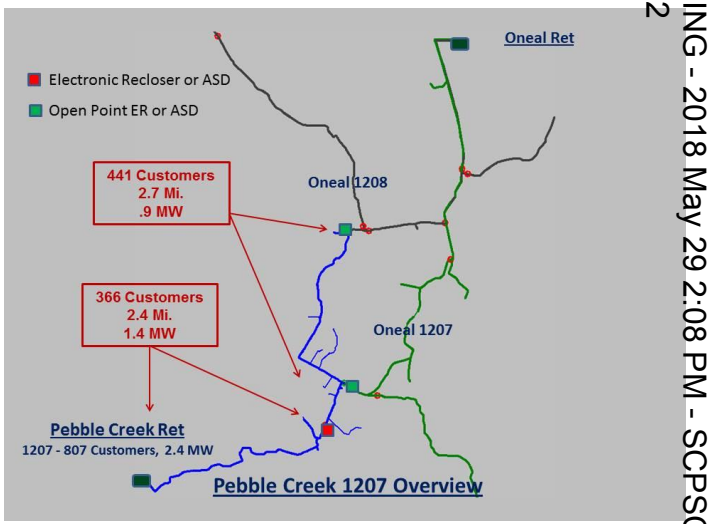
PROJECT EXAMPLE: GREENVILLE, S.C.



Two substations – Oneal and Pebble Creek

Benefits

- Automatic restorations
- Up to 75% fewer customers impacted by outage
- Two-way power flow

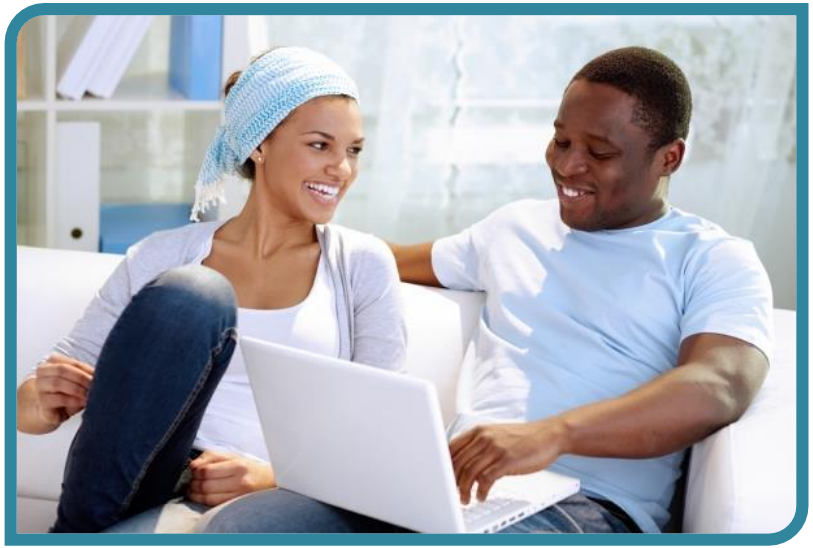


IMPROVEMENTS ACROSS THE STATE

			DEC		DEP	
Program Description	**Unit**	**Cost/Unit**	**# Units**	**Total $M**	**# Units**	**Total $M**
Automation	Automated Switches	$50,000	1,300	$65.0	300	$15.0
Capacity & Connectivity	Circuit	$650,000	360	$234.0	110	$71.5
	10-Year SC Total		**DEC**	**$299.0**	**DEP**	**$86.5**
			Grand Total $M		**$385.5**	

More options. More control. More convenience.

Power/Forward investments will improve the customer experience in many ways.



- Improving reliability and avoiding outages
- Restoring power faster by anticipating outages and intelligently rerouting power
- Offering customers more information about how they use energy, and new tools to save energy and money
- Modernizing the customer experience with improved communications, customized service and new programs

DUKE ENERGY®

Key Tenets

- Customer-focused results
- Targeted work to maximize outcomes
- Layered benefits across the state
- Flexible and future-focused

Power/Forward CAROLINAS

Our Power/Forward Plan

10-year
grid improvement plan

$3 billion
initial SC investment

strategic & targeted
to maximize value

making the grid smarter, more reliable and more secure, while stimulating economic growth


DUKE
ENERGY®